IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Jia-Chong HO et al.	Confirmation No: 2765
Appl. No.	: 10/730,073	
Filed	: December 9, 2003	
Title	: COMPOUND SEMICONDUCTOR MATERIAL AND METHOD FOR FORMING AN ACTIVE LAYER OF A THIN FILM TRANSISTOR DEVICE	
TC/A.U.	: 2822	
Examiner	: T. Y. Tran	
Docket No.:	: HOJI3001/REF	
Customer No:	: 23364	

REQUEST FOR RECONSIDERATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is in response to the Official Action of January 11, 2007, in connection with the above-identified application. The period for reply has been extended to expire on April 11, 2007 by the filing herewith of a Petition for a Three Month Extension of time and payment of the required fee.

The rejection of claims 1-3, 6, 7, 9 and 10 under 35 U.S.C. §103(a) as being unpatentable over Kawasaki et al. (US Pub. App. No. 2005/0127380) in view of Wahl et al. (US Pat No. 4,321,163) and Shimizu et al. (US Pat. No. 5,892,706) has been carefully considered but is most respectfully traversed in light of the amendments to the claims and the following comments.

Applicants wish to direct the Examiner's attention to the basic requirements of a prima facie case of obviousness as set forth in the MPEP § 2143. This section states that to establish a prima facie case of obviousness, three basic criteria first must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a

reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Section 2143.03 states that all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Applicants also most respectfully direct the Examiner's attention to MPEP § 2144.08 (page 2100-114) wherein it is stated that Office personnel should consider all rebuttal argument and evidence presented by applicant and the citation of In re Soni for error in not considering evidence presented in the specification.

The Official Action urges that figures 1A-3 and paragraph [0029] of Kawasaki disclose a compound semiconductor material for forming an active layer of thin film transistor device comprising a group II-VI compound (ZnO) and a dopant selected from group IIIA elements (B, Al, Ga, In, Tl). Applicants respectfully traverse this position primarily because Kawasaki fails to disclose a material for an active layer of a thin film transistor as recited in the claims of the instant application.

Applicants note that paragraph [0029] of Kawasaki discusses the material that may be used for the transparent electrode of the FET disclosed therein. Paragraph [0029] further states that the transparent electrode may be used either for all of the source 12, drain 13 and gate 14 shown in Figures 1A and 1B of Kawasaki or for any of them. It should be noted that Kawasaki does not disclose that the material of the transparent electrode may be used for an active layer of a thin film transistor. Accordingly, Applicants respectfully submit that the teachings of Kawasaki are limited to disclosing a doped ZnO material for a gate, drain and/or source and that there is no

teaching in Kawasaki that the doped ZnO material is the active layer of the FET disclosed therein.

To the contrary, the claims of the instant application are clearly drawn to a compound semiconductor material for forming an active layer of a thin film transistor. This feature of the claimed invention is illustrated in, e.g., Figures 5A-5D of the instant application. Figure 5D illustrates an active layer 4 disposed between a second electrode layer 3 and on top of an insulating layer 2 and a gate electrode 1. The claimed material is the material of the active layer 4, and is not used for any other portion of the TFT shown in Figure 5D. One of ordinary skill in the art would understand that the active layer is a separate component from the gate, drain and source discussed in Kawasaki, and this is further supported by Figure 5D of the instant application which shows an active layer 4 separate and distinct from the gate electrode 1. Thus, Applicants respectfully submit that Kawasaki fails to disclose a doped ZnO material that is the active layer of a TFT as recited in the claims of the instant application.

Even assuming, *arguendo*, that Kawasaki does disclose a group II-VI compound with a dopant selected from the group IIIA elements as alleged in the Official Action, Applicants respectfully submit that the cited references still fail to disclose or suggest each and every element of claim 1. Specifically, Applicants respectfully submit that the cited references, and namely the Wahl reference, fails to disclose doping with a group IIIA element in the range of 0.1 to 30 mol% as alleged in the Official Action.

The outstanding Official Action urges that Wahl discloses a compound doped with a dopant ranging from 0.2 to 8 mole percent, which falls within the claimed range of 0.1 to 30 mol%. The Official Action continues that it would have been obvious to dope the compound material of Kawasaki in the range of 0.1 to 30 mol% based upon the teaching of Wahl for increasing the conductivity of the active layer of the thin film transistor. Applicants respectfully traverse these allegations.

Firstly, in discussing the disclosure of Wahl, the Office Action fails to mention that Wahl discloses doping lithium nitride with hydrogen. Thus, the dopant disclosed in Wahl is different dopant used in the Kawasaki. Accordingly, Applicants respectfully

submit that Wahl merely teaches doping lithium nitride with hydrogen in the range of 0.2 to 8 mol% and not generally doping any material with any dopant in the range of 0.2 to 8 mol%. Thus, it cannot be said that the teaching in Wahl of doping hydrogen in the range 0.2 to 8 mol% can be combined with Kawasaki such that the group III element dopant is also doped in the 0.2 to 8 mol% range because Wahl does not discuss doping group III element dopants.

Secondly, the Official Action urges that it would have been obvious to one of skill in the art at the time of the invention to dope the compound semiconductor material with group III elements in the range of 0.2 to 8 mol% as taught in Wahl because this would increase the conductivity of the active layer of the TFT device. This motivation statement appears to be taken from, e.g., col. 1, lines 16-19 and lines 32-35 of Wahl, which discuss that "[e]specially high conductivities are obtained with hydrogen contents of approximately 0.2 to about 8 mole percent with respect to the nitrogen content of the lithium nitride." Thus, Applicants respectfully submit that the benefit of increased conductivity taught in Wahl is specifically attributed to doping hydrogen in lithium nitride, not to doping any material with any dopant. Accordingly, one of ordinary skill in the art would in no way be motivated to dope the compound semiconductor material of Kawasaki with group III element dopant in the range of 0.2 to 8 mol% based upon a teaching that doping hydrogen in lithium nitride will increase conductivity because the motivation is specific to hydrogen doped in lithium nitride. There is no statement in Wahl that doping any dopant in the range of 0.2 to 8 mol% will increase conductivity in any material, and absent such a statement, Applicants respectfully submit that a proper §103(a) rejection according to the guidelines set forth in MPEP §2143 has not been established.

Finally, with respect to the obviousness rejection of claim 1 over Kawasaki, Wahl and Shimizu, the Official Action acknowledges that the proposed combination of Kawasaki and Wahl does not disclose a precursor solution of the compound semiconductor material prepared by a Sol-gel process. The Official Action cites the Shimizu patent as allegedly disclosing a precursor solution of a compound material

prepared by a Sol-gel process and urges that it would have been obvious to modify the combination of Kawasaki and Wahl with the teaching of Shimizu for a precursor solution of the compound semiconductor material for the purpose of easily obtaining/forming the film having large surface areas in the substrate. Applicants respectfully traverse these allegations.

Applicants note that the cited portion of Shimizu discloses that "[A]lthough [the sol-gel] method allows film formation in many different atmospheres and makes it easy to obtain films having large surface areas, it has a problem in that pin holes are frequently formed on the deposited film"(emphasis added). Thus, while the Official Action repeats the alleged advantages of sol-gel method disclosed in Shimizu, the Official Action fails to notice that these advantages are disclosed in the context of the over-riding defects in the sol-gel method, i.e., the formation of undesirable pin holes. Accordingly, Applicants respectfully submit that, given the full teaching of Shimizu, one of ordinary skill in the art would not be motivated to make the proposed modification because Shimizu expressly describes the problems associated with the sol-gel method that over-ride the disclosed advantages and therefore teaches away from using the method. Accordingly, Applicants respectfully submit that the Official Action has failed to establish a proper §103(a) rejection according to the guidelines set forth in MPEP §2143.

For all of the forgoing reasons, Applicants respectfully submit that a proper §103(a) rejection according to the guidelines set forth in MPEP §2143 has not been established. Specifically, the cited references fail to disclose or suggest each and every element of the recited claims and the Official Action has also failed to provide a motivation or suggestion for why a person of ordinary skill would modify the references. Accordingly, Applicants respectfully request that the rejection of claims 1-3, 6, 7, 9 and 10 as being obvious over Kawasaki, Wahl and Shimizu be withdrawn.

The rejection of claim 5 under 35 U.S.C. §103(a) as being unpatentable over Kawasaki, Wahl and Shimizu as applied to claim 1 and further in view of Baek (US Pub App No. 2003/0219920) and the rejection of claim 8 under 35 U.S.C. §103(a) as being

unpatentable over Kawasaki, Wahl and Shimizu as applied to claim 1 and further in view of Bai (US Pub App No. 2004/0222412) have each been carefully considered but are most respectfully traversed in light of the following comments.

The rejections of claims 5 and 8 each depend upon the rejection of claim as being obvious over Kawasaki, Wahl and Shimizu. However, as discussed above, these references fail to disclose or suggest every element of claim 1. Furthermore, Applicants respectfully submit that the Baek and Bai references fail to remedy the deficiencies identified above with respect to the rejection of claim 1. Accordingly, Applicants respectfully submit that claims 5 and 8 are patentable over the references of record for the same reasons as provided above with respect to the rejection of claim 1, and Applicants therefore respectfully request that the rejections of claims 5 and 8 be withdrawn.

The rejection of claims 16-18 under 35 U.S.C. §103(a) as being unpatentable over Kawasaki in view of Wahl has been carefully considered but is most respectfully traversed in light of the following comments.

With respect to the Kawasaki reference, the Official Action urges that Figures 6A and 6B disclose a substrate 66, a gate electrode 69 deposited on the substrate 66, a dielectric layer 65 deposited on the gate electrode 69, a source electrode 62 and a drain electrode 63 deposited on the dielectric layer 65 and an active layer 61 deposited on the gate electrode 69 and source electrode 62. Applicants respectfully traverse this allegation.

Applicants fail to understand how Figure 6A and 6B may be reasonably interpreted as disclosing a dielectric layer deposited on a gate electrode. In Figure 6A, the alleged dielectric layer 65 is clearly located underneath the gate electrode 69, and therefore cannot be deemed to be deposited on the gate electrode. Similar arguments apply to the source electrode 62 and drain electrode 63, which are located under the dielectric 65 layer and are not deposited on the dielectric layer, and the active layer 61, which is located under the gate electrode 69 and the source electrode 62 and is not deposited on the gate electrode and source electrode. Accordingly, Applicants

respectfully submit that Kawasaki fails to disclose these features of the invention as clearly recited in claim 16.

The Official Action also urges that Kawasaki discloses that the active layer 61 comprises ZnO and a dopant selected from the group IIIA elements. Applicants respectfully traverse this position because Kawasaki fails to disclose a doped ZnO active layer as alleged in the Official Action.

The Official Action cites paragraph [0029] in support of the position that the active layer 61 is doped with group IIIA elements. However, as discussed above, paragraph [0029] discusses how the gate, drain and source may be doped with group IIIA elements. There is no portion of paragraph [0029] that discloses doping a channel or an active layer with group IIIA elements. Accordingly, Applicants respectfully submit that Kawasaki fails to disclose this feature of claim 16.

The Official Action relies upon the Wahl reference as disclosing the range in which the active layer may be doped with group IIIA elements and urges that it would have been obvious to combine the teaching of Wahl with Kawasaki in order to increase the conductivity. This proposed combination is flawed for two reasons. Firstly, as discussed above, Kawasaki does not disclose a doped active or channel layer. Therefore, combining the teaching of Wahl (i.e., a range of doping between 0.2 and 8 mol%) with the undoped channel layer of Kawasaki does not makes sense because the channel layer is not doped and therefore does not need a specific range of doping. Secondly, as discussed above, the teaching and motivation of Wahl is specific to hydrogen doping of a lithium nitride layer and not the general teaching of doping any material with any dopant within the disclosed range. Thus, the Wahl reference cannot be properly combined with the Kawasaki reference to arrive at the invention recited in claim 16.

For all of the forgoing reasons, Applicants respectfully submit that a proper §103(a) rejection of claims 16-18 according to the guidelines set forth in MPEP §2143 has not been established. Specifically, neither Kawasaki nor Wahl disclose or suggest every element of the claims and a proper motivation statement to combine the

references has not been supplied. Accordingly, Applicants respectfully request that this rejection be withdrawn.

The rejection of claim 19 under 35 U.S.C. §103(a) as being unpatentable over Kawasaki, Wahl and Shimizu has been carefully considered but is most respectfully traversed in light of the following comments.

Firstly, Applicants respectfully submit that the Shimizu reference fails to overcome the deficiencies identified above with respect to the obviousness rejection of claims 16-18 over Kawasaki and Wahl. Secondly, as discussed in detail above, the teaching of sol-gel process in Shimizu may not be properly combined with Kawasaki and Wahl because Shimizu teaches away from the proposed modification. Shimizu details the deficiencies of the sol-gel method and therefore one of ordinary skill in the art would not be motivated to modify Kawasaki and Wahl based upon the teaching of Shimizu.

For all of the forgoing reasons, Applicants respectfully submit that a proper §103(a) rejection of claim 19 according to the guidelines set forth in MPEP §2143 has not been established. Specifically, neither Kawasaki, Wahl nor Shimizu disclose or suggest every element of the claim and a proper motivation statement to combine the references has not been supplied. Accordingly, Applicants respectfully request that this rejection be withdrawn.

In view of the above comments, favorable reconsideration and allowance of all of the claims now present in the application are most respectfully requested.

Respectfully submitted,

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